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L11: Entry 1 of 7 File: USPT Oct 9, 2001

DOCUMENT-IDENTIFIER: US 6301303 B1
TITLE: Method and apparatus for predictively coding shape information of video signal

Application Filing Date (1):
19970519

Brief Summary Text (3):
The present invention relates in general to coding a video signal in a desired unit, and more particularly to a method and an apparatus for predictively coding shape information of the video signal, which compare shape information of the current image with that of the previous image to obtain a difference therebetween and code the shape information of the current image only when the obtained difference exceeds a predetermined reference value. For example, the present invention is applicable to a shape information coding method of the moving picture experts group-4 (referred to hereinafter as MPEG-4) which is an international standard on moving pictures and audio coding, and other image coding methods considering shape information.

Brief Summary Text (5):
Conventionally, in coding a moving picture in the unit of object, shape information are transmitted together with motion information beginning with that having the highest priority, for the prediction of motion compensation. At this time, different motion information must be applied to adjacent pixels on the object boundary.

Brief Summary Text (11):
Recently, ISO/IEC/WG11 has considered a method of coding an object with arbitrary shape information, differently from MPEG-1 and MPEG-2 performing frame-unit coding.

Brief Summary Text (12):
Here, a given video is divided into a background image and an object image, and a rectangle including the divided background image and object image is defined as a video object plane (referred to hereinafter as VOP). In MPEG-4, in the case where object regions including desired objects or areas are present in images, they are divided into VOPs and the divided VOPs are coded individually.

Brief Summary Text (32):
The shape information is a video object plane.

Detailed Description Text (9):
FIG. 4 is a block diagram illustrating the construction of each of the VOP coders 12A, 12B, . . . , 12N in the encoder 10 in FIG. 1. As shown in this drawing, each VOP coder includes a motion estimator 31, a motion compensator 32, a subtracter 33, a texture coder 34, an adder 35, a previous VOP detector 36, a shape coder 37, a multiplexer 38 and a buffer 39.

Detailed Description Text (18):

Noticeably, an output signal from the shape coder 37 is variably used according to fields to which the VOP coders 12A, 12B, . . . , 12N are applied. As indicated by the dotted lines in the drawing, the output signal from the shape coder 37 may be provided to the motion estimator 31, the motion compensator 32 and the texture coder 34 to be used for the motion estimation and compensation and the texture information coding.

Detailed Description Text (19):
The motion information estimated by the motion estimator 31, the texture information coded by the texture coder 34 and the shape information coded by the shape coder 37 are multiplexed by the multiplexer 38 and transmitted through the buffer 39 to the multiplexer 13 in FIG. 1 for the transmission in the form of bit stream.

Detailed Description Text (20):
In MPEG-4, various shape coding techniques can be applied to the shape coder 37 which codes shape information of each VOP from the VOP formation unit 11. For example, one such technique may be an MMR shape coding technique which codes shape information on the basis of N.times.N blocks, where N=16, 8 or 4. Other shape coding techniques may be a vertex-based shape coding technique, a baseline-based shape coding technique, a context-based arithmetic coding technique, etc.

Detailed Description Text (22):
First, the unit image for coding (UIC) will be described. In conventional image coding standards such as MPEG-1 and MPEG-2, there has been proposed a block-based coding technique for coding a video signal in the unit of frame, macro block or unit block regardless of the contents of image. However, as the requirements of multimedia function are increased, the necessity for video signal coding around object is increased, as well. Such an object-around coding technique requires the prescription of a new coding unit around object, not a fixed coding unit such as the conventional frame or block unit. In other words, the original frame-unit video signal is divided into significant object images with shape information, and the coding is performed with respect to each of the divided object images as a coding unit. For example, in MPEG-4, the VOP is defined as the unit image for coding.

Other Reference Publication (3):
VM Action Group, "MPEG-4 Video Verification Model Version 1.0 (Report ISO/IEC JTC1/SC29/WG11 MPEG4/N1172)", Jan. 1996, ISO/IEC XP00204798 p. 3, Paragraph 1 --p. 10, Paragraph 1; figures 2.1.1, 3.1.2.

CLAIMS:

13. A method for predictively coding shape information of a video signal, as set forth in claim 1, wherein the shape information is a video object plane.

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WEST Search History

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DATE: Thursday, October 07, 2004

Hide?	Set Name	Query	Hit Count
		DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=ADJ	
☐	L22	L21 and l5	0
☐	L21	L19 and (prioritization or prioritizer)	20
☐	L20	L19 and l7	0
☐	L19	19991215	494
☐	L18	((video or multimedia or multi-media)adj3 transmission) same MPEG	940
☐	L17	((video or multimedia or multi-media)ajd3 transmission)	0
☐	L16	((video or multimedia or multi-media)ajd3 transmission) same MPEG	0
☐	L15	((video or multimedia or multi-media)aj3 transmission)	0
☐	L14	((video or multimedia or multi-media)aj3 transmission) same MPEG	0
☐	L13	L10 and (video aj3 transmission)	0
☐	L12	L10 and MPEG	0
☐	L11	L10 and (encoder or encoding or decoder or decoding)	3
☐	L10	L8 and (prioritization or prioritizer)	17
☐	L9	L8 and video and (client near3 request)	1
☐	L8	19991215	108
☐	L7	transmission adj2 priority adj2 level	159
☐	L6	L5 and ((quality or priority) adj2 level)	20
☐	L5	19991215	54
☐	L4	((selective or selectively) near4 (route or routing or forwarding or forwarded or transmission)) same (multimedia or multi-media or time-critical)	85
☐	L3	L2 and ((transmisssion or priority) near3 level)	1
☐	L2	19991215	7
☐	L1	((packet adj2 switched) or Internet) near8 (differential adj2 service)	16

END OF SEARCH HISTORY

WEST Search History

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DATE: Thursday, October 07, 2004

Hide?	Set Name	Query	Hit Count
		DB=PGPB,USPT; PLUR=YES; OP=ADJ	
☐	L11	L10 NOT l8	7
☐	L10	L9 and (priority or prioriterizing or prioritizer or priotirization)	10
☐	L9	l3 and (texture same motion same shape)	47
☐	L8	L7 and (priority or prioriterizing or prioritizer or priotirization)	4
☐	L7	L6 and control	28
☐	L6	L5 and shape	64
☐	L5	L4 and motion	68
☐	L4	L3 and texture	70
☐	L3	19991215	125
☐	L2	L1 and MPEG	383
☐	L1	video adj object adj plane	402

END OF SEARCH HISTORY

L21: Entry 5 of 20 File: USPT Jul 13, 1999

DOCUMENT-IDENTIFIER: US 5923814 A
TITLE: Methods and apparatus for performing video data reduction operations and for concealing the visual effects of data reduction operations

Application Filing Date (1):
19970815

Brief Summary Text (5):
One digital video compression and data transmission format that offers particular promise with regard to high definition television ("HDTV") is the ISO-MPEG (International Standards Organization--Moving Picture Experts Group) standard described in a report titled "Coding of Moving Pictures and Associated Audio for Digital Storage Media up to about 1.5 Mbits/s", ISO 2 11172 rev 1, Jun. 10, 1992 hereby expressly incorporated by reference.

Brief Summary Text (7):
It is to be understood that various features of the present invention, such as data recording techniques, as opposed to, e.g., specific data prioritization and selection techniques, are generally not data format dependent and are therefore not limited to applications involving specific data formats.

Detailed Description Text (22):
In accordance with this codeword prioritization approach, each codeword in the full rate data bit stream received by the VTR is assigned a priority level or number based on its relative importance to generating a video frame having good image quality. Accordingly, codewords are prioritized as a function of their importance in generating video frames during long play modes of VTR playback operation.

Detailed Description Text (23):
The prioritization scheme used to support long play modes of VTR operation are likely to be similar to those used for trick play prioritization described in U.S. patent application Ser. No. 08/003,887, titled "DIGITAL VIDEO RECORDING DEVICE". Accordingly, a digital VTR that contains hardware for trick play prioritization such as the one in the above identified copending patent application, could implement a long play prioritization scheme according to the present invention at little or no additional cost.

Detailed Description Text (24):
One suitable prioritization scheme for prioritizing video codewords for use in a reduced rate bit stream suitable for supporting long play mode digital VTR operation is described below with regard to an MPEG based data stream. Listed below are the types of data that may be contained in a codeword, and the suggested priority number to be assigned to the codeword containing the data. It should be noted that the data in each codeword correspond to, or is associated with, a particular video frame represented by the data in the video data stream.

Detailed Description Text (25):
One suitable prioritization order for long play mode VTR operation, listed in order from the most important to the least important data, is as follows:

Detailed Description Text (36):
While the goal of the above prioritization scheme is to provide a method by which the data rate can be reduced, it is important to note that the reduced rate data stream generated during VTR long play mode operation should include sufficient data to support the same frame display rate supported during standard play mode.

Detailed Description Text (38):
Thus, while the above prioritization scheme is similar to that suggested for trick play prioritization, the reduced rate data stream generated for long play mode operation should include B-picture data that are of little or no use during trick play operation. Such B-pictures are normally not displayed during trick play operation and the data needed to generate such B-pictures are therefore normally omitted from a trick play data stream.

Detailed Description Text (42):
In such an embodiment, it is desirable to maintain the same relative amounts of higher order I-, P- and B- DCT coefficients in the reduced rate bit stream as found in the full rate bit stream. Accordingly, the relative amounts of data represented by the codewords which are assigned to priority levels 8, 9 and 10, in accordance with the prioritization scheme of the present invention, should be selected for inclusion in the reduced rate bit stream in approximately the same ratios found in the full rate bit stream received by the digital VTR.

Detailed Description Text (44):
While the above prioritization scheme is described using MPEG terminology, it should be noted that the prioritization scheme can be readily generalized to numerous other digital video compression systems.

Detailed Description Text (51):
Simulations have shown that requantizing with a higher quantization factor gives better results than data reduction through the use of data prioritization, when the two methods are used to achieve the same total data rate reduction. However, data prioritization is a simpler operation to implement than requantization. Accordingly, it may be cheaper to implement a long play mode in a digital VTR using data prioritization and selection rather than requantization to achieve the desired reduction in the data rate. However, the use of requantization provides superior results in terms of image quality.

Detailed Description Text (53):
In the previously described methods, the bit rate was reduced by either 1) performing variable length decoding, data prioritization, selection of the prioritized data and re-encoding of the selected data or 2) performing variable length decoding, re-quantizing of the decoded data with an adjusted quantization scale factor selected to produce a reduced bit rate, and re-encoding of the re-quantized data. In accordance with each of these methods data reduction is performed uniformly over each video picture. Accordingly, data reduction is performed without taking into consideration the screen location of the image portion to be produced by the data upon which data reduction is being performed.

Detailed Description Text (56):
Thus, because of this type of prioritization, when data are selected to form the reduced rate bit stream, a relatively high amount of data corresponding to the center of video pictures will be selected while a relatively lesser amount of the data corresponding to the edges of video pictures will be selected for inclusion in the reduced rate bit stream. In this manner, data representing the center portion of video pictures may be included in the reduced bit rate stream at the same or at a slightly reduced bit rate when compared to the full bit rate stream. However, data representing the edges of video pictures will be included in the reduced rate bit stream at a bit rate that is significantly lower than the bit rate of such data

in the full bit rate data stream.

Detailed Description Text (64):
Data reduction methods 1 and 3 can be combined such that data prioritization and selection can be used as the method of reducing the data rate to produce a reduced rate bit stream from a full rate bit stream.

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L3: Entry 1 of 1 File: USPT Nov 4, 2003

DOCUMENT-IDENTIFIER: US 6643258 B1
TITLE: Communication resource management method and node device using priority control and admission control

Application Filing Date (1):
19981022

Brief Summary Text (15):
For instance, in the IETF, the scheme called "Differential Service (D. Clark and J. Wroclawski, "An Approach to Service Allocation in the Internet", Internet Draft draft-clark-diff-svc-alloc-00.txt) and the scheme called "SIMA" (K. Kilkki "Simple Integrated Media Access (SIMA)", Internet Draft draft-kalevi-simple-media-access-01.txt) have been proposed. These are schemes in which a tag indicating a high priority level is written into a packet at a rate proportional to the bandwidth allocated to the flow.

Brief Summary Text (16):
For example, in the case of allocating a bandwidth of 100 [Kbps] to a flow A, the edge node provided at the ingress side of the network monitors the flow A, and writes a value indicating a high priority level in packets up to 100 [Kbps]. At a node inside the network, when congestion occurs, packets with a lower priority level is much more likely to be discarded than packet with higher priority level. In this way, the packets belonging to the flow A will be transferred at a high priority level within the range of 100 [Kbps].

Brief Summary Text (17):
Thus the flow can receive the transfer service at the high priority level as much as the bandwidth that are allocated to it. In this scheme, it suffices for the node inside the network to deal with the priority level written in the packets without becoming conscious of the flow so that there is an advantage that it is sufficient to carry out a simple processing.

Brief Summary Text (18):
FIG. 1 shows an exemplary realization of the differential service. In FIG. 1, a flow A and a flow B are transferred through a network 301. This network 301 comprises core nodes 101-103 and edge nodes 201-204, which are connected through communication links. The core nodes 101-103 carry out the priority processing at a time of packet transfer according to priority tags written in packets. The edge nodes 201-204 are located outside the core nodes 101-103 and write tags indicating the priority levels with respect to packets of the respective flows.

Brief Summary Text (19):
Within the network 301, the flow A is transferred through a route of the edge node 204, the core node 103, the core node 102, and the edge node 202, while the flow B is transferred through a route of the edge node 201, the core node 101, the core node 102, and the edge node 202. The edge node 204 writes a tag indicating the high priority level into packets up to 100 [Kbps] among the packets belonging to the flow A, while the edge node 201 writes a tag indicating the high priority level into packets up to 200 [kbps] among the packets belonging to the flow B. At the

nodes 101-103 and 201-203 inside the network 301, when it is inevitable to discard some packets, the low priority packets, i.e., those packets in which the high priority tag is not written, will be discarded at a high priority. As a result, in this network 301, the packets belonging to the flow A up to 100 [Kbps] are transferred at the high priority while the packets belonging to the flow B up to 200 [Kbps] are transferred at the high priority.

Brief Summary Text (25):
On the other hand, in the scheme such as the differential service in which a tag indicating the priority level is to be written in packets at a rate proportional to the bandwidth at an edge node provided at the ingress side of the network and the priority control is to be carried out at a time of the transfer processing according to this priority level at a node inside the network, there arise the second problem in that it is impossible to guarantee the communication quality to each flow, and the third problem that it is difficult to make up a plan for augmenting the node facilities according to the bandwidth consumed at each node.

Brief Summary Text (29):
According to one aspect of the present invention there is provided a method for managing communication resources in a network containing edge nodes located at a boundary of the network and core nodes located inside the network, comprising the steps of: (a) storing at one edge node an information for obtaining an available amount of communication resources that can be newly allocated in the network to one set of flows which share at least a route from said one edge node to an egress node of the network; (b) carrying out an admission control at said one edge node by newly receiving a request for allocation of communication resources for one flow belonging to said one set of flows, judging whether or not to accept the request according to a requested amount of communication resources and the available amount of communication resources as obtained from the information stored at the step (a) for said one set of flows, and allocating requested communication resources to said one flow when it is judged that the request is to be accepted; and (c) transmitting packets at said one edge node by describing a priority level in each packet according to an amount of communication resources allocated to a flow of the packets at the step (b), such that a core node carries out a transfer processing with respect to received packets according to the priority level described in each received packet.

Brief Summary Text (32):
According to another aspect of the present invention there is provided a method for managing communication resources in a network containing edge nodes located at a boundary of the network and core nodes located inside the network, comprising the steps of: (a) carrying out a priority control in which an edge node transmits packets by describing a priority level in each packet according to an amount of communication resources allocated to a flow of the packets, and a core node carries out a transfer processing with respect to received packets according to the priority level described in each received packet; (b) transmitting from one edge node a notification regarding an amount of communication resources allocated to a set of flows which include one flow and which share at least a route from said one edge node to an egress node of the network, according to an amount of communication resources allocated to said one flow; and (c) receiving the notification at one core node and calculating an amount of communication resources to be consumed at said one core node according to the notification.

Brief Summary Text (36):
According to another aspect of the present invention there is provided a method for managing communication resources in a network containing edge nodes located at a boundary of the network and core nodes located inside the network, comprising the steps of: (a) carrying out a priority control in which an edge node transmits packets by describing a priority level in each packet according to an amount of communication resources allocated to a flow of the packets, and a core node carries

L6: Entry 1 of 20 File: PGPB Oct 24, 2002

DOCUMENT-IDENTIFIER: US 20020154210 A1
TITLE: VIDEOCONFERENCING HARDWARE

Application Filing Date:
19970407

Detail Description Paragraph:
[0064] Note in FIG. 3 that Data LAN hub 25, A/V Switching Circuitry 30 and MLAN Server 60 also provide respective lines 25b, 30b, and 60e for coupling to additional multimedia resources 16 (FIG. 1), such as multimedia document management, multimedia databases, radio/TV channels, etc. Data LAN hub 25 (via bridges/routers 11 in FIG. 1) and A/V Switching Circuitry 30 additionally provide lines 25c and 30c for coupling to one or more other MLANs 10 which may be in the same locality (i.e., not far enough away to require use of WAN technology). Where WANs are required, WAN gateways 40 are used to provide highest quality compression methods and standards in a shared resource fashion, thus minimizing costs at the workstation for a given WAN quality level, as discussed below.

Detail Description Paragraph:
[0135] The AVNM 63 manages A/V Switching Circuitry 30 in FIG. 3 for selectively routing audio/video signals to and from CMWs 12, and also to and from WAN gateway 40, as called for by clients. Audio/video devices (e.g., CMWs 12, conference bridges 35, multimedia resources 16 and WAN gateway 40 in FIG. 3) connected to A/V Switching Circuitry 30 in FIG. 3, have physical connections for audio in, audio out, video in and video out. For each device on the network, the AVNM combines these four connections into a port abstraction, wherein each port represents an addressable bidirectional audio/video channel. Each device connected to the network has at least one port. Different ports may share the same physical connections on the switch. For example, a conference bridge may typically have four ports (for 2.times.2 mosaicing) that share the same video-out connection. Not all devices need both video and audio connections at a port. For example, a TV tuner port needs only incoming audio/video connections.

L6: Entry 7 of 20 File: USPT May 22, 2001

DOCUMENT-IDENTIFIER: US 6237025 B1
TITLE: Multimedia collaboration system

Application Filing Date (1):
19971219

Detailed Description Text (25):
Note in FIG. 3 that Data LAN hub 25, A/V Switching Circuitry 30 and MLAN Server 60 also provide respective lines 25b, 30b, and 60e for coupling to additional multimedia resources 16 (FIG. 1), such as multimedia document management, multimedia databases, radio/TV channel setc Data LAN hub 25 (via bridges/routers 11 in FIG. 1) and A/V Switching Circuitry 30 additionally provide lines 25c and 30c for coupling to one or more other MLANs 10 which may be in the same locality (i.e., not far enough away to require use of WAN technology) Where WANs are required, WAN gateways 40 are used to provide highest quality compression methods and standards in a shared resource fashion, thus minimizing costs at the workstation for a given WAN quality level, as discussed below.

Detailed Description Text (101):
The AVNM 63 manages A/V Switching Circuitry 30 in FIG. 3 for selectively routing audio/video signals to and from CMWs 12, and also to and from WAN gateway 40, as called for by clients Audio/video devices (e.g., CMWs 12, conference bridges 35, multimedia resources 16 and WAN gateway 40 in FIG. 3) connected to A/V Switching Circuitry 30 in FIG. 3, have physical connections for audio in, audio out, video in and video out. For each device on the network, the AVNM combines these four connections into a port abstraction, wherein each port represents an addressable bidirectional audio/video channel. Each device connected to the network has at least one port Different ports may share the same physical connections on the switch. For example, a conference bridge may typically have four ports (for 2.times.2 mosaicing) that share the same video-out connection. Not all devices need both video and audio connections at a port. For example, a TV tuner port needs only incoming audio/video connections.

L6: Entry 9 of 20 File: USPT Nov 21, 2000

DOCUMENT-IDENTIFIER: US 6151598 A
TITLE: Digital dictionary with a communication system for the creating, updating, editing, storing, maintaining, referencing, and managing the digital dictionary

Application Filing Date (1):
19971204

Detailed Description Text (31):
Thirdly, there is Multimedia Reference Pointer 706 means which produces a selective multimedia representation or reference material for selective instances of said combination of alphabet, code, character, sign, or number, wherein each said instance correspond with selective user or application during a selective period of time. Furthermore, said multimedia representation can be retrieved from External Multimedia Equipment 712 which further includes selective multimedia database, transmission, storage, processing, display, or printing machines.

Detailed Description Text (34):
In a more preferred embodiment, FIG. 4 teaches a method for interconnecting a selective plurality of document and multimedia equipment for efficient storage and retrieval, wherein said document equipment 615 includes a plurality of selective document database, transmission, storage, processing, display, or printing machines; and said multimedia equipment 712 includes selective multimedia database, transmission, storage, processing, display, or printing machines.

Detailed Description Text (211):
For compound document including motion video, the FORM 210 is comprised of a OBJECT ID circuit, which receives standard MACROBLOCK subimages from PREP 202 and produce a list of moving objects for each input frame. The FORM 210 is also comprised of a PRIORITY ASSIGN circuit which evaluate application requirement from OIF 224 and communication constraint from BAND 228 and assign the appropriate run-time priority level to each moving object and MACROBLOCK subimage. Provided the run-time bandwidth is insufficient, the FORM 210 is further comprised of an X-Y INTERPOLATE circuit which receive MACROBLOCK subimages, moving objects, and their associated run-time priority levels and produce a reformatted MACROBLOCK subimage and moving objects. When the run-time bandwidth is proven to be sufficient, the FORM 210 is further comprised of DATA TRANSFER circuit which transfer the formatted macroblock subimage to ENC 208 and PACK 218 for further processing.

Detailed Description Text (219):
The OIF 224, as part of the PACK 218, is comprised of a INTERFACE circuit, which receives application priority requirements from user, application, and/or network and produce the appropriate message signal to FORM 210 in further assigning the run-time priority levels for each object and subimage. OIF 224 is further comprised of DRIVER circuit which allow direct interface with a plurality of external commercial DOS, UNIX, WINDOW, NT, or OS2 application programs. OIF 224 is also comprised of a programmable BIOS circuit which direct execute under a commercial operating system.

L9: Entry 1 of 1 File: USPT Aug 12, 2003

DOCUMENT-IDENTIFIER: US 6606413 B1
TITLE: Compression packaged image transmission for telemicroscopy

Application Filing Date (1):
19990601

Brief Summary Text (7):
The enabling tool for providing telepathology services is a telemicroscopy system connected to a bi-directional telecommunications network which is pervasive enough to allow the necessary equipment to be set up and operated virtually anywhere. Conventional forms of telemicroscopy equipment are generally well known in the art and suitably comprise a remote controlled microscope system where microscope images are acquired with a conventional video camera and transmitted, for display, to a control system. Remote operation of the microscope system and remote display of transmitted images can be realistically performed using a variety of communications technologies. However, in order to ensure a general availability of a developing telepathology network, interconnectivity is most realistic in the context of narrow band or broadband landline connections. Narrow band systems (like PSTN and ISDN) generally guarantee worldwide availability for very low costs, but at the price of bandwidth and/or channel capacity. Broadband systems (like ATM) allow enhanced channel capacity but still suffer from a lack of sufficient bandwidth to allow video transmissions at anything approximating real-time. Because of these limitations, conventional telemicroscopy systems have had to make certain compromises between channel capacity and image quality. The higher the quality of the transmitted image, the longer the time it takes to complete a transmission. Conversely, when transmission speed is an overriding concern, image quality necessarily suffers.

Brief Summary Text (8):
With a limited bandwidth available on PSTN (Public Switched Telephone Network) and ISDN (Integrated Services Digital Network), the only means available to increase transmission speed is to reduce the average number of transmitted bits per image, i.e., compress the digital image data developed by video camera. Before telepathology services become truly viable, image transmission must operate at bit rates of only a few hundred kilobits or a few megabits per second, which can only be achieved through rather large compression of the data.

Brief Summary Text (9):
Most sensory signals contain a substantial amount of redundant or superfluous information. For example, a conventional video camera, that captures approximately 30 frames per second from a stationary image, produces very similar frames, one after the other. Compression techniques attempt to remove the superfluous information from repetitive frames, such that a single frame can be represented by a reduced amount of finite data, or in the case of time varying images, by a lower data rate. It is well known in the art that digitized video signals comprise a significant amount of statistical redundancy, i.e., samples are similar to each other such that one sample can be predicted fairly accurately from another. By removing the predictable or similarity component from a stream of samples, the video data rate can be reduced. Such statistical redundancy is able to be removed

without perturbing the remaining information. That is, the original uncompressed data is able to be recovered almost exactly by various inverse operations. The algorithms used in a compression system depend on the available bandwidth, the features required by the application, and the affordability of the hardware required for implementation of the compression algorithm on both the encoding and decoding side.

Drawing Description Text (6):
FIG. 4 is a semi-schematic simplified block diagram of one embodiment of a video image transmission system including multi-tiered compression according to the present invention;

Drawing Description Text (7):
FIG. 5 is a semi-schematic simplified block diagram of a decompression system adapted to receive compression packaged is video image transmissions in accordance with the invention;

Detailed Description Text (2):
In order to gain a complete understanding of the compression packaged image transmission system and method of the present invention, it will be useful to examine how the system might function in the context of a typical telepathology procedure. During the course of a surgical intervention, as a surgeon is preparing to perform an invasive procedure, the surgeon will typically remove a sample of tissue from a patient and forward the tissue sample to the hospital's diagnostic laboratory for immediate evaluation. The tissue sample is prepared in conventional fashion and loaded onto the sample stage of an examining microscope, comprising the laboratory's telemicroscopy system, where an image of the tissue sample is captured by a video camera and electronically communicated to a pathologist at a remote site for evaluation. During the initial, or preliminary, evaluation, a pathologist is able to view the tissue sample in macro and is further able to give directions to laboratory personnel as to location and direction of sectioning to be performed in order to further any subsequent diagnosis. Frozen sections are prepared according to the guidelines of the pathologist, the sections are mounted on glass slides, appropriately stained, and subsequently loaded onto a robotically controlled microscope stage of the telemicroscopy system. Control of the telemicroscopy system is then given to the remote-site pathologist.

Detailed Description Text (4):
Following the pathologist's investigation, the pathologist can prepare a report which provides the surgeon with his diagnostic opinion in the case, either over the same bi-directional communication medium used to examine the specimen, or by any one of a number of various other electronic communication forms available to the pathologist. In particular, the pathologist may transmit a written protocol to the surgeon by facsimile, e-mail, and the like, or make a direct oral report to the surgeon and follow-up with written documentation communicated electronically. After making a diagnosis, the pathologist releases the telemicroscopy connection and is then available for a next consultation with some other surgery team which might be preparing to perform a different surgical procedure in a totally different location. In the meantime, the original consulting surgeon is able to continue the intervention procedure according to the outcome of the diagnosis made by the pathologist. As a check, the original consulting surgeon may decide to forward the original tissue specimen to a local pathology laboratory for a final diagnosis, in accordance with conventional accepted procedure. This manner of "Gold Standard" cross-checking, is particularly useful as a means of acquiring data on the accuracy of results obtained by formulating diagnostic opinions on the basis of televised images which have been compressed, transmitted over long distances over relatively "noisy" communication connections, decompressed and viewed on a high resolution video monitor screen.

Detailed Description Text (6):

Turning now to FIG. 1, there is depicted a simplified semi-schematic block diagram of an exemplary host or server telemicroscopy system useful in the practice of the present invention. FIG. 1 illustrates the primary components of a remote, or robotically, controllable telemicroscope, operable under software program control which would be hosted on a control processor such a small platform personal computer system. In accordance with the invention, telemicroscopy equipment connected to a telecommunication net in accord with a bi-directional communication protocol, forms a key enabling tool for establishing effective telemedicine services. This allows the system to combine the high-resolution and color saturation is integrity of digital, still video images with the ability to establish bi-directional communication between the "server" and a "client" system to enable remote, client control of the microscope in real time. Acquisition and transmission of high-resolution video images of desired portions of a specimen can be performed in a time period consistent with hands-on, real-time optical practice.

Detailed Description Text (12):
If the system is configured to operate semi-closed-loop, or open-loop, stage control is not dependent on feedback per se, but it is at least necessary to precisely define where the motors controlling the stage were told to go. For reasons detailed further below, the transmitted video image is compression packaged in a manner that takes stage motion (both relative degree and absolute magnitude) into account when defining the compression packaging technique used under various circumstances.

Detailed Description Text (14):
A video camera 22 is optically coupled to the microscope to capture diagnostic-quality images of microscopic tissue samples disposed on the sample stage. The video camera 22 is preferably a high resolution, color, digital video camera operating at an image resolution in accordance with, at least, the NTSE standardized composite color video image specification. Examples of video cameras suitable for use in connection with the present invention include the Sony DKC-5000 series of video cameras, the Ikegami 370-M video camera, and other makes and models of composite, color video cameras of comparable quality and resolution. Images captured by the video camera 22 are directed through video image processors 24 whereby they are able to be displayed on a high resolution digital display screen coupled to the telemicroscope control processor 20.

Detailed Description Text (15):
In addition, and in accordance with the present invention, high-resolution video images captured by the camera are compression packaged by the control processor 20 for transmission over a telecommunications interface 26, coupled, in turn, to a wide-area-network 28 such as the Internet.

Detailed Description Text (16):
The images developed by the video camera should have at least the resolution available under the NTSC standard. In North America and Japan, the NTSC color video image comprises approximately 480 pels per image scan line in the red, green and blue (RGB) color components. Approximately 480 scan lines comprise an image frame, and image frames are generated at a rate of approximately 30 frames per second. If each color component is coded as an 8-bit value (24 bits/pel, i.e., "true color") representing some form of luminance plus color difference encoding, for example, the representing continuous composite video is produced at a bit rate of about 168 Megabits per second (Mbps). For truly high resolution image production suitable for telepathology applications, the video camera should be able to generate still images with resolutions preferably in the range of from 800.times.600 (pels.times.lines) to about 1024.times.1024 (pels.times.lines). These images are transmitted at frame rates of 30 fps and, at 24 bits per pel, this results in an image bit rate in excess 750 Mbps.

L21: Entry 11 of 20 File: USPT Aug 20, 1996

DOCUMENT-IDENTIFIER: US 5548532 A
TITLE: Apparatus and method for formulating an interactive TV signal

Application Filing Date (1):
19940428

Brief Summary Text (5):
The present invention is directed toward formatting executable codes and data, defining interactive applications, with video and audio program material, for reliable and convenient access. The method includes compressing audio and video programs according to a protocol such as MPEG. The compressed audio and video (AN) programs are then segmented into transmission or transport packets, with audio transport packets identified by a first service identifier SCID.sub.Ai, and video transport packets identified by a second service identifier, SCID.sub.Vi. Interactive application programs associated with A/V programs are compiled into functional modules and condensed. A module may be executable software or data. A module includes code/data and a header. The code/data portion of each module undergoes cyclic redundancy coding (CRC) over the entire module and CRC check bits are concatenated or appended to the module. Respective modules are segmented into transport packets. The code/data transport packets are identified by a third service identifier SCID.sub.Di. The transport packets are formed into transmission units comprising an integer number of code/data transport packets and a header transport packet. A special directory module is generated which includes information for informing a receiver device of the modules incorporated in an application program. Video packets, audio packets and module packets are subsequently time division multiplexed for transmission.

Detailed Description Text (19):
Regarding the prioritization of packet multiplexing during the non-video packet multiplexing time slots, if a priority is imposed, it is preferred that the signal component with packets that occur very infrequently be assigned a higher multiplexing priority.

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L8: Entry 1 of 4 File: USPT Jan 28, 2003

DOCUMENT-IDENTIFIER: US 6512793 B1
TITLE: Data processing apparatus and method

Application Filing Date (1):
19990426

Brief Summary Text (7):
Further, in a moving image, a method to perform encoding in object units has been studied as an international standard method, MPEG4 (Moving Picture Experts Group phase 4) (Eto, "MPEG4 Standardization" (The Journal of The Institute of Image Electronics Engineers of Japan, vol. 25, No. 3, 1996, pp. 223-228). FIG. 1 shows an example of a frame of a moving image to be encoded by the MPEG4 coding. In FIG. 1, a frame 20 comprises four objects as shown in FIG. 2, i.e., a background object 28, an object 21 representing a helicopter, an object 22 representing a train, and an object 23 representing a car. To indicate the shapes of the objects except the background, each object is masked such that a black part of a rectangular area surrounding the object is an "outer area", and a white part is an "inner area" (24 to 26 in FIG. 2), and by this masking, an arbitrary shaped object can be handled.

Brief Summary Text (12):
The visual object data has visual_object_start_code (Visual Object SC in FIG. 25) for identification at its header, then profile_and_level_indication (PLI in FIG. 25) indicative of an encoding level. Then, information on visual objects, is_visual_object_identifier (IVOI in FIG. 25), visual_object_varid (VOVID in FIG. 25), viausl_object_priority (VOPRI in FIG. 25), visual_object_type (VOTYPE in FIG. 25) and the like follow. These data construct header information of the visual object. "VOTYPE" has a value "0001" if the image is a moving image obtained by image pickup. Then, video object (VO) data as a cluster of moving image code data follows.

Brief Summary Text (13):
The VO data is code data indicative of each object. The VO data has video_object_start_code (VOSC in FIG. 25) for identification at its header, further, the VO data has video object layer data (VOL data in FIG. 25) to realize scalability. The VOL data has video_object_layer_start_code (VOLSC in FIG. 25) and video object plane data (VOP data in FIG. 25) corresponding to one frame of moving image. The VOL data has video_object_layer_width (VOL_width in FIG. 25) and video_object_layer_height (VOL_height in FIG. 25) indicative of size, at its header. Also, the VOP data has video object plane width (VOP_width in FIG. 25) and video object plane height (VOP_height in FIG. 25) indicative of size, at its header. Further, the header of the VOL data has bit_rate code indicative of bit rate.

Brief Summary Text (22):
The above-described profile and level are indicated in the PLI in a bit stream of MPEG4 code data as shown in FIG. 25. Accordingly, a decoder which decodes a bit stream of MPEG code data can determine whether or not decoding is possible by referring to the PLI. The decoding is impossible in the following case.

Brief Summary Text (30):
According to the present invention, the foregoing object is attained by providing a data processing apparatus having decoding means for decoding code encoded in image object units, said apparatus comprising: detection means for detecting the number of objects included in input code and the number of objects decodable by said decoding means; and control means for controlling the number of objects of the input code, based on the number of objects and the number of decodable objects detected by said detection means.

Brief Summary Text (32):
According to the present invention, to attain the foregoing object, the above-described apparatus further comprises: extraction means for extracting location information of the objects included in said code; and combining means for combining code of a plurality of objects, based on an instruction from said control means and the location information extracted by said extraction means.

Brief Summary Text (33):
Further, to attain the foregoing object, the above-described apparatus further comprises: extraction means for extracting motion information indicative of motions of the objects included in said code; and combining means for combining a plurality of objects based on an instruction from said control means and the motion information extracted by said extraction means.

Brief Summary Text (35):
Further, another object of the present invention is to provide data processing apparatus and method which control the number of objects included in code data.

Brief Summary Text (36):
According to the present invention, the foregoing objects are attained by providing a data processing apparatus for processing a data array to reproduce an image with a plurality of coded image objects, said apparatus comprising: detection means for detecting the number of image objects included in said data array; and control means for controlling the number of image objects included in said data array based on the number of image objects detected by said detection means.

Brief Summary Text (40):
Further, another object of the present invention is to provide data processing apparatus and method which control the number of objects included in code data and/or the information amount of the code data.

Brief Summary Text (41):
According to the present invention, the foregoing objects are attained by providing a data processing apparatus for processing a data array to reproduce one frame image with a plurality of coded image objects, said apparatus comprising: input means for inputting a plurality of data arrays; instruction means for instructing synthesizing of a plurality of data arrays inputted by said input means; designation means for designating coding specifications of a processed data array; control means for controlling information amounts of the plurality of data arrays inputted by said input means, based on the coding specifications designated by said designation means; and synthesizing means for synthesizing the plurality of data arrays with information amounts controlled by said control means, based on the coding specifications designated by said designation means.

Drawing Description Text (15):
FIG. 12 is an example of 1-frame code data to be motion-compensated;

Detailed Description Text (9):
FIG. 8 is an example of 1-frame code data. The code data has "Header" indicative of the attribute of the frame at its head, next, code data indicative of background object (Object 0 in FIG. 8). Then, code data of the respective objects, i.e., code

L8: Entry 2 of 4 File: USPT Jul 18, 2000

DOCUMENT-IDENTIFIER: US 6092107 A
TITLE: System and method for interfacing MPEG-coded audiovisual objects permitting adaptive control

Abstract Text (1):
The invention provides a system and method allowing the adaptation of a nonadaptive system for playing/browsing coded audiovisual objects, such as the parametric system of MPEG-4. The system of the invention is referred to as the programmatic system, and incorporates adaptivity on top of the parametric system. The parametric system of MPEG-4 consists of a Systems Demultiplex (Demux) overseen by digital media integration framework (DMIF), scene graph and media decoders, buffers, compositer and renderer. Adaptations possible with the invention include interfaces in the categories of media decoding, user functionalities and authoring, thus allowing a number of enhanced functionalities in response to use input as well as graceful degradation in response to limited system resources. The invention includes a specification of an interfacing method in the form of an application programming interface (API). Hot object, directional, trick mode, transparency and other interfaces are specified.

Application Filing Date (1):
19980407

Parent Case Text (2):
This application is related to U.S. Provisional Application Ser. No. 60/042,798 from which priority is claimed.

Brief Summary Text (7):
The need for interoperability, guaranteed quality and performance and economies of scale in chip design, as well as the cost involved in content generation for a multiplicity of formats has lead to advances in standardization in the areas of multimedia coding, packetization and robust delivery. In particular, ISO MPEG (International Standards Organization Motion Picture Experts Group) has standardized bitstream syntax and decoding semantics for coded multimedia in the form of two standards referred to as MPEG-1 and MPEG-2. MPEG-1 was primarily intended for use on digital storage media (DSM) such as compact disks (CDs), whereas MPEG-2 was primarily intended for use in a broadcast environment (transport stream), although it also supports an MPEG-1 like mechanism for use on DSM (program stream). MPEG-2 also included additional features such as DSM Command and Control for basic user interaction as may be needed for standardized playback of MPEG-2, either standalone or networked.

Brief Summary Text (8):
With the advent of inexpensive boards/PCMCIA cards and with availability of Central Processing Units (CPUs), the MPEG-1 standard is becoming commonly available for playback of movies and games on PCs. The MPEG-2 standard on the other hand, since it addresses relatively higher quality applications, is becoming common for entertainment applications via digital satellite TV, digital cable and Digital Versatile Disk (DVD). Besides the

Brief Summary Text (9):
applications and platforms noted, MPEG-1 and MPEG-2 are expected to be utilized in various other configurations, in streams communicated over network and streams stored over hard disks/CDs, as well as in the combination of networked and local access.

Brief Summary Text (10):
The success of MPEG-1 and MPEG-2, the bandwidth limitation of Internet and mobile channels, the flexibility of web-based data access using browsers, and the increasing need for interactive personal communication has opened up new paradigms for multimedia usage and control. In response, ISO-MPEG started work on a new standard, MPEG-4. The MPEG-4 standard has addressed coding of audio-visual information in the form of individual objects and a system for composition and synchronized playback of these objects. While the MPEG-4 development of such a fixed parametric system continues, in the meantime, new paradigms in communication, software and networking such as that offered by the Java language have offered new opportunities for flexibility, adaptivity and user interaction.

Brief Summary Text (13):
Second, regardless of the bandwidth available, the client side PC on which decoding may have to take place may be limited in CPU and/or memory resources, and furthermore, these resources may be time-varying. Third, a multimedia user (consumer) may require highly interactive nonlinear browsing and playback; this is not unusual, since a lot of textual content on web pages is capable of being browsed using hyperlinked features and the same paradigm is expected for presentations employing coded audio-visual objects. The parametric MPEG-4 system may only be able to deal with the aforementioned situations in a very limited way, such as by dropping objects or temporal occurrences of objects it is incapable of decoding or presenting, resulting in choppy audio-visual presentations. Further, MPEG-4 may not offer any sophisticated control by the user of those kinds of situations. To get around such limitations of the parametric system, one potential option for MPEG-4 development is in a programmatic system.

Brief Summary Text (14):
The use of application programming interfaces (APIs) has been long recognized in the software industry as a means to achieve standardized operations and functions over a number of different types of computer platforms. Typically, although operations can be standardized via definition of the API, the performance of these operations may still differ on various platforms as specific vendors with interest in a specific platform may provide implementations optimized for that platform. In the field of graphics, Virtual Reality Modeling Language (VRML) allows a means of specifying spatial and temporal relationships between objects and description of a scene by use of a scene graph approach. MPEG-4 has used a binary representation (BIFS) of the constructs central to VRML and extended VRML in many ways to handle real-time audio/video data and facial/body animation. To enhance features of VRML and to allow programmatic control, DimensionX has released a set of APIs known as Liquid Reality. Recently, Sun Microsystems has announced an early version of Java3D, an API specification which among other things supports representation of synthetic audiovisual objects as scene graph. Sun Microsystems has also released Java Media Framework Player API, a framework for multimedia playback. However, none of the currently available API packages offer a comprehensive and robust feature set tailed to the demands of MPEG-4 coding and other advanced multimedia content.

Brief Summary Text (16):
The invention provides a system and method for interfacing coded auidovisual objects, allowing a nonadaptive client system, such as the parametric MPEG-4 system, to play and browse coded audiovisual objects in adaptive fashion. The system and method of the invention is programmatic at an architectural level, and adds a layer of adaptivity on top of the parametric system by virtue of a defined set of application programming interfaces specifically configured to access and

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Generate Collection

L8: Entry 3 of 4 File: USPT May 2, 2000

DOCUMENT-IDENTIFIER: US 6057884 A
TITLE: Temporal and spatial scaleable coding for video object planes

Abstract Text (1):
Temporal and spatial scaling of video images including video object planes (VOPs) in an input digital video sequence is provided. Coding efficiency is improved by adaptively compressing scaled field mode video. Upsampled VOPs in the enhancement layer are reordered to provide a greater correlation with the input video sequence based on a linear criteria. The resulting residue is coded using a spatial transformation such as the DCT. A motion compensation scheme is used for coding enhancement layer VOPs by scaling motion vectors which have already been determined for the base layer VOPs. A reduced search area whose center is defined by the scaled motion vectors is provided. The motion compensation scheme is suitable for use with scaled frame mode or field mode video. Various processor configurations achieve particular scaleable coding results. Applications of scaleable coding include stereoscopic video, picture-in-picture, preview access channels, and ATM communications.

Application Filing Date (1):
19970605

Brief Summary Text (2):
The present invention relates to a method and apparatus for providing temporal and spatial scaling of video images including video object planes in a digital video sequence. In particular, a motion compensation scheme is presented which is suitable for use with scaled frame mode or field mode video. A scheme for adaptively compressing field mode video using a spatial transformation such as the Discrete Cosine Transformation (DCT) is also presented.

Brief Summary Text (3):
The invention is particularly suitable for use with various multimedia applications, and is compatible with the MPEG-4 Verification Model (VM) 3.0 standard described in document ISO/IEC/JTC1/SC29/WG11 N1642, entitled "MPEG-4 Video Verification Model Version 7.0", April 1997, incorporated herein by reference. The invention can further provide coding of stereoscopic video, picture-in-picture, preview access channels, and asynchronous transfer mode (ATM) communications.

Brief Summary Text (4):
MPEG-4 is a new coding standard which provides a flexible framework and an open set of coding tools for communication, access, and manipulation of digital audio-visual data. These tools support a wide range of features. The flexible framework of MPEG-4 supports various combinations of coding tools and their corresponding functionalities for applications required by the computer, telecommunication, and entertainment (i.e., TV and film) industries, such as database browsing, information retrieval, and interactive communications.

Brief Summary Text (5):
MPEG-4 provides standardized core technologies allowing efficient storage, transmission and manipulation of video data in multimedia environments. MPEG-4

achieves efficient compression, object scalability, spatial and temporal scalability, and error resilience.

Brief Summary Text (6):
The MPEG-4 video VM coder/decoder (codec) is a block- and object-based hybrid coder with motion compensation. Texture is encoded with an 8.times.8 DCT utilizing overlapped block-motion compensation. Object shapes are represented as alpha maps and encoded using a Content-based Arithmetic Encoding (CAE) algorithm or a modified DCT coder, both using temporal prediction. The coder can handle sprites as they are known from computer graphics. Other coding methods, such as wavelet and sprite coding, may also be used for special applications.

Brief Summary Text (7):
Motion compensated texture coding is a well known approach for video coding. Such an approach can be modeled as a three-stage process. The first stage is signal processing which includes motion estimation and compensation (ME/MC) and a 2-D spatial transformation. The objective of ME/MC and the spatial transformation is to take advantage of temporal and spatial correlations in a video sequence to optimize the rate-distortion performance of quantization and entropy coding under a complexity constraint. The most common technique for ME/MC has been block matching, and the most common spatial transformation has been the DCT. However, special concerns arise for ME/MC and DCT coding of the boundary blocks of an arbitrarily shaped VOP.

Brief Summary Text (8):
The MPEG-2 Main Profile is a precursor to the MPEG-4 standard, and is described in document ISO/IEC JTC1/SC29/WG11 N0702, entitled "Information

Brief Summary Text (9):
Technology--Generic Coding of Moving Pictures and Associated Audio, Recommendation H.262,11, " March 25, 1994, incorporated herein by reference. Scalability extensions to the MPEG-2 Main Profile have been defined which provide for two or more separate bitstreams, or layers. Each layer can be combined to form a single high-quality signal. For example, the base layer may provide a lower quality video signal, while the enhancement layer provides additional information that can enhance the base layer image.

Brief Summary Text (12):
Accordingly, it would be desirable to provide temporal and spatial scalability functions for coding of video signals which include video object planes (VOPs) such as those used in the MPEG-4 standard. It would be desirable to have the capability for coding of stereoscopic video, picture-in-picture, preview access channels, and asynchronous transfer mode (ATM) communications.

Brief Summary Text (13):
It would further be desirable to have a relatively low complexity and low cost codec design where the size of the search range is reduced for motion estimation of enhancement layer prediction coding of bi-directionally predicted VOPs (B-VOPs). It would also be desirable to efficiently code an interlaced video input signal which is scaled to base and enhancement layers by adaptively reordering pixel lines of an enhancement layer VOP prior to determining a residue and spatially transforming the data. The present invention provides a system having the above and other advantages.

Brief Summary Text (15):
In accordance with the present invention, a method and apparatus are presented for providing temporal and spatial scaling of video images such as video object planes (VOPs) in a digital video sequence. The VOPs can comprise a full frame and/or a subset of the frame, and may be arbitrarily shaped. Additionally, a plurality of VOPs may be provided in one frame or otherwise be temporally coincident.

Brief Summary Text (16):
A method is presented for scaling an input video sequence comprising video object planes (VOPs) for communication in a corresponding base layer and enhancement layer, where downsampled data is carried in the base layer. The VOPs in the input video sequence have an associated spatial resolution and temporal resolution (e.g., frame rate).

Brief Summary Text (23):
In a specific application, the base and enhancement layer provide a picture-in-picture (PIP) capability where a PIP image is carried in the base layer, or a preview access channel capability, where a preview access image is carried in the base layer. In such applications, it is acceptable for the PIP image or free preview image to have a reduced spatial and/or temporal resolution. In an ATM application, higher priority, lower bit rate data may be provided in the base layer, while lower priority, higher bit rate data is provided in the enhancement layer. In this case, the base layer is allocated a guaranteed bandwidth, but the enhancement layer data may occasionally be lost.

Brief Summary Text (24):
A method is presented for scaling an input video sequence comprising video object planes (VOPs) where downsampled data is carried in the enhancement layer rather than the base layer. With this method, a first particular one of the VOPs of the input video sequence is provided in the base layer as a first base layer VOP, e.g., without changing the spatial resolution. Pixel data of at least a portion of the first base layer VOP is downsampled to provide a corresponding first downsampled VOP in the enhancement layer at a temporal position corresponding to the first base layer VOP. Corresponding pixel data of the first particular one of the VOPs is downsampled to provide a comparison VOP, and the first downsampled VOP is differentially encoded using the comparison VOP.

Brief Summary Text (26):
A method for coding a bi-directionally predicted video object plane (B-VOP) is also presented. First and second base layer VOPs are provided in the base layer which correspond to the input video sequence VOPs. The second base layer VOP is a P-VOP which is predicted from the first base layer VOP according to a motion vector MV.sub.P. The B-VOP is provided in the enhancement layer temporally between the first and second base layer VOPs.

Brief Summary Text (27):
The B-VOP is encoded using at least one of a forward motion vector MV.sub.f and a backward motion vector MV.sub.B which are obtained by scaling the motion vector MV.sub.P. This efficient coding technique avoids the need to perform an independent exhaustive search in the reference VOPs. A temporal distance TR.sub.P separates the first and second base layer VOPs, while a temporal distance TR.sub.B separates the first base layer VOP and the B-VOP.

Brief Summary Text (28):
A ratio m/n is defined as the ratio of the spatial resolution of the first and second base layer VOPs to the spatial resolution of the B-VOP. That is, either the base layer VOPs or the B-VOP in the enhancement layer may be downsampled relative to the VOPs of the input video sequence by a ratio m/n. It is assumed that either the base or enhancement layer VOP has the same spatial resolution as the input video sequence. The forward motion vector MV.sub.f is determined according to the relationship MV.sub.f =(m/n).multidot.TR.sub.B .multidot.MV.sub.P /TR.sub.P, while the backward motion vector MV.sub.b is determined according to the relationship MV.sub.b =(m/n).multidot.(TR.sub.B -TR.sub.P).multidot.MV.sub.P /TR.sub.P. m/n is any positive number, including fractional values.

Brief Summary Text (29):

L8: Entry 4 of 4 File: USPT Aug 10, 1999

DOCUMENT-IDENTIFIER: US 5936671 A
TITLE: Object-based video processing using forward-tracking 2-D mesh layers

Abstract Text (1):
The invented method involves the object-based processing of parts of video frames referred to as Video Object Planes using 2-D meshes, wherein the color and shape information associated with the Video Object Planes are assumed to be known at every frame and wherein each video object is processed independently. The invented method more particularly involves utilization of the Alpha Planes, which contain the shape information, in object-based design of an initial 2-D mesh, wherein an Alpha Plane is used to form a constraining polygonal mesh boundary, as well as in object-based tracking of mesh node points, wherein motion vectors of nodes on the mesh boundary are constrained so that these node points always lie along the Alpha Plane boundary, by means of restriction of the search space or back-projection, and mesh-based Video Object Plane mapping takes into account any differences between the mesh boundary and the Video Object Plane boundary. Such invented methods may be computer-implemented or computer-assisted, as by being coded as software within any coding system as memory-based instructions executed by a microprocessor, PC or mainframe computer, or may be implemented in hardware such as a state machine.

Application Filing Date (1):
19970702

Parent Case Text (2):
This application claims priority from U.S. provisional patent application Ser. No. 60/021,093, filed on Jul. 2, 1996, the disclosure of which is incorporated hereby by this reference.

Brief Summary Text (5):
[1] Y. Altunbasak, A. M. Tekalp and G. Bozdagi, "Two-dimensional object based coding using a content-based mesh and affine motion parameterization," IEEE Int. Conference on Image Processing, Washington D.C., October 1995.

Brief Summary Text (9):
[5] L. Chiariglione, "MPEG and multimedia communications," IEEE Trans. on Circ. and Syst. for Video Technology, vol. 7, no. 1, pp. 5-18, February 1997.

Brief Summary Text (12):
[8] Y. Nakaya and H. Harashima, "Motion compensation based on spatial transformations," IEEE Trans. on Circuits and Systems for Video Technology, vol. 4, no. 3, pp. 339-356, June 1994.

Brief Summary Text (15):
[11] T. Sikora, "The MPEG-4 Video Standard Verification Model," IEEE Trans. on Circ. and Syst for Video Technology, vol. 7, no. 1, pp. 19-31, February 1997.

Brief Summary Text (16):
[12] G. J. Sullivan and R. L. Baker, "Motion compensation for video compression using control grid interpolation," Proc. ICASSP '91, vol. 4, pp. 2713-2716, May

1991.

Brief Summary Text (18):
[14] C. Toklu, A. T. Erdem, M. I. Sezan and A. M. Tekalp, "Tracking motion and intensity variations using hierarchical 2-D mesh modeling," Graphical Models and Image Processing, vol. 58, no. 6, pp. 553-573, November 1996.

Brief Summary Text (26):
Briefly summarized, the invented method involves the object-based processing of parts of video frames referred to as Video Object Planes using 2-D meshes, wherein the color and shape information associated with the Video Object Planes are assumed to be known at every frame and wherein each video object is processed independently. The invented method more particularly involves utilization of the Alpha Planes, which contain the shape information, in object-based design of an initial 2-D mesh, wherein an Alpha Plane is used to form a constraining polygonal mesh boundary, as well as in object-based tracking of mesh node points, wherein motion vectors of nodes on the mesh boundary are constrained so that these node points always lie along the Alpha Plane boundary, by means of restriction of the search space or back-projection, and mesh-based Video Object Plane mapping takes into account any differences between the mesh boundary and the Video Object Plane boundary. Such invented methods may be computer-implemented or computer-assisted, as by being coded as software within any coding system as memory-based instructions executed by a microprocessor, PC or mainframe computer, or may be implemented in hardware such as a state machine.

Drawing Description Text (3):
FIG. 2 illustrates object-based forward motion modeling versus frame-based forward motion modeling and frame-based backward motion modeling.

Drawing Description Text (6):
FIG. 5 illustrates details of object-based motion estimation and motion compensation with a forward tracking mesh layer.

Detailed Description Text (3):
Object-based video representations allow for object-based compression, storage and transmission, in addition to object-based video manipulation, such as editing. Object-based video compression methods are currently being developed in the context of the MPEG-4 standardization process [5, 11]. This disclosure describes methods for object-based video motion representation using forward tracking 2-D mesh layers, where one mesh layer is used for each object.

Detailed Description Text (4):
Following MPEG-4 terminology [11], a "Video Object" (VO) refers to spatio-temporal data pertinent to a particular object and a "Video Object Plane" (VOP) refers to a two-dimensional (2-D) snapshot of a Video Object at a particular time instant (similar to a video frame). Each VOP consists of a number of color components, for instance a Y, U and V component, as well as a shape component or "Alpha Plane", describing its shape and opacity. This data structure is depicted in FIG. 1. VOPs can be I, P or B type as in MPEG-1 and -2, which are previously adopted and published standards that are precursors to the developing MPEG-4 standard. Those of skill in the art will appreciate that such VOP types will be referred to herein as I-VOPs, P-VOPs and B-VOPs, respectively, corresponding to I-frames, P-frames and B-frames in the case of MPEG- 1 or -2. Note that the Alpha Planes are herein assumed to be known for every VOP in the VO. In practice, the Alpha Planes can be obtained using for example chroma-keying. Note further, that different video objects may have been acquired with different cameras. On the other hand, different video objects may have been obtained from a single camera shot, by partitioning each frame into the constituent video object planes. A layered video representation similar to the data structure described above was discussed in [18].